

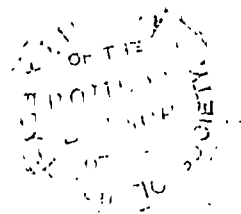
REPORT

OF THE

CHEMICAL ANALYSER TO GOVERNMENT, BOMBAY,

FOR THE YEAR 1888.

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1889.

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REPORT

OF THE

CHEMICAL ANALYSER TO GOVERNMENT, BOMBAY,

FOR THE YEAR 1888.

To

THE SECRETARY TO GOVERNMENT,
General Department.
Bombay.

SIR,

As Chemical Analyser to the Government of Bombay I have the honour to submit the following report for the year 1888, being the eighteenth Annual Report of this Department.

2. The following is a summary of the work done by the department during the year under report:—360 medico-legal cases, involving the separate analysis or examination of 1,216 different articles, were investigated and reported on: in addition, 280 samples of potable water and 1,052 samples of Government stores and miscellaneous articles were examined or analysed, making a gross total of 2,548 different articles examined or analysed during the year.

3. The table which follows, shows the number of the medico-legal cases reported on and other analyses effected, during each of the last five years:—

Class.	1884.	1885.	1886.	1887.	1888.
Medico-legal cases	314	336	296	282	360
Potable waters	98	108	112	207	280
Government stores	384	318	444	355	500
Customs and A'bkari analyses	493	576	479	652	598
Miscellaneous	82	88	92	52	54
Total ...	1,371	1,456	1,423	1,518	1,792

From the above table it will be seen that the work falling on this department continues year by year to increase in amount. It has actually just doubled during the last ten years and is now more than five times as great as it was in 1871-72, the first year in which an annual report was submitted by this department. The work of this department, I in fact may say, has now attained such proportions as to make the provision of additional superior assistance most desirable.

Section I.—Medico-Legal.

4. The 360 medico-legal cases referred to this office during the year 1888 were forwarded from 118 different stations and may as usual be divided into three classes, viz., (1) cases of real or alleged poisoning of human beings, (2) cases of real or alleged cattle-poisoning, and (3) other cases, chiefly cases involving the examination of articles suspected to be stained with blood or other animal fluids. Of the 360 medico-legal cases referred to this office during the year under report, 182 belong to the 1st, 91 to the 2nd, and 87 to the 3rd of these classes. The table below gives corresponding figures for the past five years, from which it will be seen that the total number of cases forwarded for examination during the year under report was larger than usual, chiefly owing to the number of cases in which articles were sent to be examined for stains of blood being unusually great:—

Class.	1884.	1885.	1886.	1887.	1888.
Suspected human-poisoning	169	187	159	159	182
Do. cattle-poisoning	103	101	83	84	91
Blood stains, &c.	42	48	54	39	87
Total ...	314	336	296	282	360

5. *Cases of Suspected Human-poisoning.*—Of the 182 cases of this class referred for examination and report during the past year, some poison or other was detected in 84, or about 46·2 per cent., a rather smaller percentage than usual.

6. The table which now follows shows the general nature of the poison found in each of the 84 cases of alleged human-poisoning in which poison was detected during the year. The cases are distributed according to the districts from which they were forwarded:—

Districts..	Arsenic.	Pounded Glass.	Other Mineral Poisons.	Opium.	Dhatura.	Other Organic Poisons.	Total.
Admedabad	2	...	1	...	...	1	4
Admednagar	...	...	1	...	...	...	1
Belgaum	4	...	2	...	...	...	6
Bijápur	1	...	...	...	...	...	1
Bombay	3	...	...	1	...	...	4
Broach	2	...	...	...	...	...	2
Dhárwár	1	...	1	...	...	...	2
Kaira	1	...	2	3	2	...	8
Kaládgi	1	...	...	...	...	...	1
Khándesh	...	1	...	...	...	...	1
Násik	1	...	1	5	...	...	7
Poona	3	1	2	...	1	1	8
Panch Maháls	4	...	...	...	...	...	4
Sátára	2	...	1	1	...	1	5
Sholápur	1	...	1	3	...	2	7
Sind	8	...	...	...	...	1	9
Surat	...	1	...	...	...	...	1
Total ...	34	3	12	13	3	6	71
Native States	3	...	1	2	1	...	7
Central Provinces and Berárs ...	4	...	...	...	1	1	6
Grand Total ...	41	3	13	15	5	7	84

7. So far as could be made out from the reports furnished to this office the 84 cases of alleged human-poisoning in which poison was detected during the past year included the poisoning of 102 persons, of whom 48 died. As will be seen from the table which follows, the number of cases in which poison was detected was exactly the same as last year. The number of persons poisoned and the number of deaths are both higher than last year but lower than the corresponding numbers for 1886:—

	1884.	1885.	1886.	1887.	1888.
A.—Cases—					
Arsenic	47	51	47	42	41
Opium	9	20	12	14	15
Dhatura... ..	4	5	4	5	5
Other poisons	23	26	26	23	23
Total cases ...	83	102	89	84	84

	1884.	1885.	1886.	1887.	1888.
B.—Persons poisoned—					
Arsenic	50	91	88	47	59
Opium	9	18	11	13	15
Dhatura... ..	10	17	13	21	9
Other poisons	29	27	16	14	19
Total persons poisoned ...	98	153	128	95	102
C.—Deaths—					
Arsenic	22	32	31	20	26
Opium	9	18	11	13	14
Dhatura... ..	1	...	...	2	1
Other poisons	3	14	8	2	7
Total deaths ...	35	64	50	37	48

8. Below is a more detailed statement showing the poison found in each of the 84 cases referred to:—

Poisons.	Cases.
Arsenious oxide	34
Sulphides of arsenic	5
Arsenite of copper	2
Pounded glass	3
Copper	6
Mercury	5
Red-lead	2
Opium	15
Dhatura	5
Alcohol	2
Hydrocyanic acid	1
Nerium odorum	1
Solanum Nigrum	1
Plumbago Rosea	1
Vegetable irritant	1
	84

9. *Arsenic.*—Of the 41 cases in which arsenious oxide was detected during the year, 9 were cases in which more than one person was poisoned. The 9 cases include 7 deaths, *viz.*, 3 children, 3 men and 1 woman. A summary of these 9 cases is as follows:—(1) a case from Karáchi in which arsenic was found in the viscera of a girl and in the vomit of several adults, all of whom were attacked with the usual symptoms of arsenical poisoning after eating food (boiled rice) found on analysis to contain arsenic. With the exception of the girl all the individuals poisoned in this case appear to have recovered: (2) a case from Tásgaon (Sátára District) in which arsenic was found in the viscera of a girl aged 3, who with her mother, who recovered, were poisoned by arsenic contained in bread given to them by a person in custody: (3) a case, apparently one of accidental poisoning, from Godhra (Panch Maháls) in which 3 adults and 2 boys were poisoned. Of the 2 boys the younger aged 10 died, all the other affected persons recovered. In this case it was reported that a woman having ground some grain made a quantity of bread from it, of which she herself, her husband, her two brothers and a female visitor all partook. All, including the woman who made the bread, were attacked shortly afterwards with the usual symptoms of irritant poisoning. A portion of the bread and of the flour from which it had been made, sent with the viscera of the boy, for analysis were both found to contain arsenic in small quantity, about 2 to 2½ grains per lb.: (4) a case from Karáchi in which 3 men, 2 of whom died, one in about 24 hours and the other on the third day, were poisoned by arsenic supposed to have been administered to them in

food : (5) a case from Buldāna (Berār) in which 2 men were poisoned, one of the cases ending fatally. Some of the poison supposed to have been employed in this case was forwarded for examination and proved to be orpiment or yellow sulphide of arsenic : (6) a case, apparently like No. 3 one of accidental poisoning, from Sehwan (Sind) in which 2 women, one of whom died, were poisoned. The history furnished with this case was to the effect that a woman while overhauling the contents of a bag belonging to her husband's brother found some sugar in it of which she and her mother partook. Both soon after began to vomit and purge, and the younger of the two women died. The remaining three cases were all non-fatal and were :—(7) a case, apparently one of attempt at homicide, from Sirur (Poona District). In this case a quantity of arsenious oxide was found in some food which it was reported had caused vomiting in two persons, a woman and a girl, who had partaken of it. This food, it was stated, had been given to the sufferers by a woman who was on ill terms with them : (8) a case from Belgaum in which arsenic was found in some flour and in some bread said to have been made from it. This bread, it was stated, had caused symptoms of irritant poisoning in three children, all of whom recovered. The report furnished with this case was to the effect that a man gave a woman some flour to make into bread, saying that he would send for the bread in the evening. This he failed to do and the woman's children getting hold of the bread began to eat it and were soon after attacked by vomiting, &c. : (9) an apparently accidental case from Pānchgani (Sātāra District) in which arsenic was found in small quantity in some Nāchni flour. In this case it was reported that eleven persons, all of whom recovered, suffered from symptoms of irritant poisoning after partaking of food prepared from the flour forwarded for examination.

10. 19 more of the cases in which arsenic was detected during the year were fatal cases in which one person only was poisoned. Of these 19 persons 13 were male adults, 4 were children and 2 were adult females. Of the 13 cases in which male adults died from the effects of arsenical poisoning 6 appear to have been cases of homicide and in 4 of these the wife of the deceased was suspected of having administered the poisons. These 4 cases were : (1) a case from Nāsik in which it was stated that the wife of the deceased had been carrying on an intrigue with another man : (2) a case from Sehwan (Sind) in which the poison was given in cooked *dāl* : (3) a case from Lārkhāna (Sind) in which the wife of the deceased was reported to have confessed to the crime : and (4) a case from Chikodi (Belgaum District) in which arsenic, besides being detected in the viscera of the deceased, was also detected in matters vomited by him, and in some washings from a grinding-stone, presumably the one used in preparing the food. The other 2 homicidal cases in which the victims were male adults were : (5) a case from Amraoti (Berārs) in which a man who had been ill for some time with rheumatism and severe bronchitis died suddenly ; the motive in this case was reported to be a dispute about property : and (6) a case from Akola (Berārs) in which 20 grains of white arsenic was found in the contents of the stomach of a man who, it was stated, had been poisoned by another man, the poison having been given in sweetmeat. 3 more of the fatal cases among male adults were reported to be cases of suicide, *viz.*, (7) a case from Jacobabad (Sind) : (8) a case from Godhra (Panch Mahāls) : and (9) a case from Mudhol (Native State). In this last case it was stated that the deceased committed suicide while in the custody of the Police on a charge of theft. About 30 grains of white arsenic was found in the alimentary canal, and in addition a quantity of finely pounded glass was found in the contents of the intestines. In the remaining 4 fatal cases among adults it was not stated whether the case was suspected to be homicidal, suicidal or accidental. The 4 cases were : (10) a case from Dākori (Kaira District) : (11) a case from Buldāna (Berārs) : (12) a case from Lārkhāna (Sind) : and (13) a case from Bābra (Native State) in which arsenic was found in the solid viscera, but not in the contents of the stomach, of a man whose body was exhumed on the tenth day after burial. As regards the 4 fatal cases among children the information furnished with at least two of these points to homicide. These 4 cases were : (1) a case from Modāsa (Ahmedabad District) in which the poison was found in the viscera of a boy aged 5 who died $4\frac{1}{2}$ hours after eating some sweetmeat given to him by some one while he was at play : (2) a case from Bāgalkot (Bijāpur District) in which about 5 grains of white arsenic was found in the alimentary canal of a girl aged 8. In this case a suspicious circumstance

was that the girl previous to her fatal illness had several attacks of vomiting and purging, from each one of which she recovered: (3) a case from Karáchi in which a girl was admitted into hospital suffering from the usual symptoms of arsenical poisoning and died on the third day. Deceased, it was stated about three hours previous to her admission into hospital, had been given a white powder by her mother: and (4) a case which occurred in Bombay in which a girl aged 7 picked up a mass of white stuff in the road and ate it, dying seven hours afterwards. This mass of white stuff as also another mass found near the same place by the girl's friends proved on examination to be arsenious oxide. The 2 fatal cases among female adults were: (1) a Bombay suicidal case, and (2) a probably suicidal case from Sholápur in which about 15 grains of arsenious oxide was found in the contents of the stomach of a deceased female.

11. It will be seen from the last two paragraphs that the 26 deaths from arsenical poisoning reported to this office during the past year were thus distributed: 9 occurred in Sind, 4 in the Berárs and 2 each in Native States, Panch Maháls and Bombay. The remaining 7 occurred one each in the following districts:—Ahmedabad, Belgaum, Bijápur, Kaira, Násik, Sátára and Sholápur. Of the persons who died from arsenical poisoning 16 were male adults, 7 children and 3 female adults. Of the male adult cases 7 were reported as homicidal, 3 as suicidal and 6 were doubtful; of the 7 cases among children probably at least 4 were homicidal; and of the 3 cases among female adults 1 was suicidal, 1 accidental and 1 doubtful.

12. In addition to the 28 cases already mentioned, arsenic was detected during the year in 13 other cases, all non-fatal. Of these 13 in 7 the poison was detected in the form of arsenious oxide, and of the 7, 4 appear to have been attempts at homicide. A summary of the 4 attempted homicidal cases is as follows: (1) a case from Godhra (Panch Maháls) in which arsenious oxide was found in some cooked rice prepared by a woman for her husband: (2) a case from Bijápur in which arsenious oxide was found in some powders said to have been given by one woman to another for the purpose of poisoning a man: (3) a case from Pálanpur (Native State) in which arsenious oxide was found in the vomit of a man, and a powder found in the possession of the accused was ascertained to be a mixture of orpiment and carbonate of lime: and (4) a case from Belgaum in which some food prepared by a woman for her husband was found to contain both arsenic and copper. The remaining 3 cases were: (5) a case from Junnar (Poona District) in which a mass of white substance weighing 1,580 grains found in an accused person's house proved to be a mass of arsenious oxide: (6) a case from Khed (Poona District) in which some sugar forwarded for examination and alleged to contain sulphate of copper was found to contain much arsenious oxide but copper only in minute quantity: and (7) a case from Godhra (Panch Maháls) in which arsenious oxide was found in some half-ground maize. In this case it was reported that a woman having bought some maize in the market made some of the upper stratum of the maize into bread which was eaten without ill effect. On commencing, however, to grind some of the lower stratum of the maize she had purchased white particles were seen to be mixed with it; this excited suspicion and some of the white particles were given to a fowl, the fowl died, and on this a complaint was made to the Police.

13. In the remaining 6 non-fatal cases in which arsenic was detected the poison was found in a form other than arsenious oxide. 2 of the 6 appear to have been attempts at homicide by arsenite of copper, viz., (1) a case from Belgaum in which arsenite of copper was found in some bread cakes prepared by a woman for her husband: and (2) a case from Jambusar (Broach District) in which a man laid a complaint that an attempt had been made to poison him by putting a green powder into his drinking water; some of the water produced was found to contain arsenite of copper in suspension. The 4 other cases were, (3) a case from Ahmedabad in which a powder found in the possession of a woman accused of causing herself to miscarry was found to be a mixture of orpiment and chalk: (4) a case from Gadag (Dhárwár District) in which some food prepared by a woman for her husband was found to contain realgar and arsenious oxide. The poison in this case, it was stated, had been supplied by a paramour of the wife: (5) a case from Broach in which a quantity of orpiment and a quantity of

arsenious oxide were found in the house of an accused in a murder case : and (6) a case referred to me by the Ophthalmic Surgeon, Bombay, in which some minute particles of realgar were found imbedded in the cornea of a man as the result of the explosion of a quantity of fire-work composition.

14. *Pounded Glass*.—In addition to the cases mentioned in paragraph 10 (9) in which pounded glass was found along with arsenic in the viscera of a male suicide, 3 other cases were brought to the notice of this office during the year in which pounded glass formed the agent employed. All 3 appear to have been attempts at homicide. The 3 cases were, (1) a case from Párdi (Surat District) in which pounded glass was found in some rice-flour and in which it was reported that a man had been seen to throw a powder into the hand-mill in which the rice was being ground : (2) a case from Bárámati (Poona District) in which some finely pounded pale pink glass was found in some bread which had been given to a man and also in some flour from which the bread had been made : and (3) a case from Bhusával (Khándesh District) of an alleged attempt by a woman to poison her husband. In this case some partly ground grain taken out of a hand-mill was found to contain pounded glass of different colours evidently from their appearance and the shape of one of the larger pieces of glass fragments of bangles. It was further reported in this case that the man for whom the food was prepared was attacked by vomiting after eating it.

15. *Copper*.—Of the 6 cases in which a compound of this metal was detected, 1 from Dhandhuka (Ahmedabad District) appears to have been a case of acute fatal poisoning of a woman by sulphate of copper. The only history furnished with this case was that deceased was supposed to have been poisoned. The *post-mortem* appearances were those of death from irritant poisoning and the only poison which could be detected in the viscera was copper. Of this metal however enough was separated from the contents of the stomach and intestines to correspond to about 70 grains of crystallized sulphate of copper. Of the other 5 cases 2 appear to have been cases of accidental poisoning arising from the contamination of food by copper cooking vessels, *viz.*, (2) a case from Sirur (Poona District) in which copper in small quantity was detected in some bread which had caused vomiting in 6 persons : and (3) a case from Chikodi (Belgaum District) in which also copper in minute quantity was detected in some food which had been prepared in a copper cooking vessel. The other 3 cases in which copper was detected were : (4) a case from Shevgaon (Ahmednagar District) in which some sulphate of copper formed one of several matters found in the house of a woman who died suddenly : (5) a case from Sholápur in which some sulphate of copper was found on searching the house of an accused person in an abortion case : and (6) a case from Belgaum in which among various matters found in the house of a woman accused of poisoning 2 men the following were identified as poisonous—(a) sulphate of copper, (b) red lead, and (c) Nux vomica seeds.

16. *Mercury and Lead*.—The first named of these two metals was detected in 5 cases during the year. Of the 5 in one case only from Sinnar (Násik District) was there any history of actual use of the mercurial compound as a poison. In the case referred to a woman after eating some bread given to her by her mistress was attacked by symptoms of irritant poisoning followed by salination. A portion of the bread which had been given to her was found on examination to contain a preparation of mercury, probably Raskápur or impure Calomel. Of the other 4 cases, in 1 from Rájkot, Raskápur was found in a powder which it was stated had been given by one person to another for use as a poison. In another from Háveri (Dhárwár District) a mass of Cinnabar (mercuric sulphide) was found in the house of a person accused of attempting to poison 4 other persons, and in the remaining 2 cases, both from Borsad (Kaira District) pills found in the possession of suspected persons were on examination found to contain a compound of mercury. Lead was detected in 2 cases, *viz.*, (1) in a case from Karád (Sátára District). In this case a woman died after abortion evidently, from the *post-mortem* appearances, induced by local irritant applications. On searching her house the Police found a number of "abortion sticks" armed in the usual way with a red-coloured preparation which on examination was found to contain red lead : and (2) in a case from Bárámati (Poona District) in which it was alleged that a man had been seen to put a powder into some congy which a girl was preparing for her mother. The congy was forwarded for examination and

found to contain red lead. Accused, it was further stated, had three days previously given to the same woman something to eat which caused her to vomit and purge. Besides the two cases just mentioned red lead was found in a third case, *viz.*, in the contents of the stomach of a woman who died from opium-poisoning, see paragraph 17.

17. *Opium*.—Of the 15 cases in which opium was detected during the year in 13 this drug was detected in the viscera of adults and in 1 case in the viscera of a child. In the remaining case from Sinnar (Násik District) the drug was detected in matters removed by the stomach-pump from the stomach of a man who had attempted to commit suicide. The case in which opium was found in the viscera of a child came from Akluj (Sholapur District), but was unaccompanied by any history save a statement to the effect that it was suspected that the child had died from opium poisoning. Of the 13 fatal cases among adults in 7 the deceased persons were males and in 6 females. In 6 of the 13 cases—3 males and 3 females—the cases were reported as suicidal; in the other 7 no clue was given as to the nature of the case. Of the 13 adult cases 4 came from Násik, 3 from Kaira and 2 from Sholápur Districts; the remaining 4 cases came one each from Bombay, Káthiáwár, Sátára and a Native State. Two of the fatal cases among adults may be specially mentioned, *viz.*, (1), a case from Borsad (Kaira District) in which in the contents of the stomach of a woman, a widow, besides opium, there was found a quantity of red lead. Red lead was also found adhering to the inside of a cup said to have been used in preparing the poison. Among the particulars forwarded with this case it was mentioned that the woman's friends had given her dog's focus as an antidote or emetic: (2) a male suicidal case from Jálna (Native State) in which the symptoms were peculiar. In this case, reported by Surgeon E. H. Brown, 3rd Infantry, H. C., it was stated that on admission into hospital the patient was insensible, his skin *dry*, his pupils *normal*, and his respiration slow and deep. Soon after admission the respirations fell to 6 per minute and soon afterwards a complete intermission of respiration occurred lasting about 28 seconds, followed immediately by another lasting 60 seconds. After these intermissions respiration became re-established and remained slow and deep for about two hours. The patient was then seized with a tetanic convulsion accompanied by arrest of respiration lasting about 40 seconds. On cessation of the fit respiration became re-established as before and remained so for about three hours, when another general convulsion occurred in which the patient died.

18. *Dhatúra*.—5 cases of poisoning by this drug were reported during the year. In all 5 Daturine was detected in food which had given rise to symptoms of Dhatúra poisoning, *viz.*, in 1 case in bread, in 2 cases in flour and in 2 cases in cooked vegetable food. In 1 of the 5 cases from Amráoti (Berárs) the victims, it was stated, were 4 in number and in another from Sorath (Native State) 2 persons, a man and a girl, were the sufferers. In each of the other 3 cases one person only was poisoned, the victim in each case being a male adult. Of these 3 cases 2 came from A'nand (Kaira District) and 1 from Haveli (Poona District). In 1 of the 2 cases from A'nand the victim died. This was the only fatal case of poisoning by Dhatúra reported to this office during the year.

19. *Other Poisons*.—The 7 cases included under this head are: (1) a case from Sholápur of fatal acute alcoholic poisoning. Deceased in this case, a male adult, after a drinking bout, was admitted into hospital in a comatose condition. The stomach was emptied by the stomach-pump and in the fluid so removed a quantity of alcohol was detected: (2) a similar case from Doregaon (Berárs): (3) a case from Kirkee in which hydrocyanic (Prussic) acid was found in the viscera of a woman. As far as could be gathered from the history furnished the poison in this case was self-administered: (4) a female suicidal case from Sátára in which portions of the plant which had been taken were identified as *Nerium odorum* or oleander: (5) a case from Karáchi in which 3 children, one of whom died, suffered from symptoms resembling those of Dhatúra poisoning after eating food with which certain berries had been mixed. Some of the berries forwarded were identified as berries of *Solanum nigrum*, and from the viscera of the child who died an alkaloid was extracted, probably

solanin, which when injected subcutaneously into small animals gave rise to distinct narcotic symptoms: (6) a case from Pandharpur (Sholapur District) in which some drugs found on searching the house of a reputed sorcerer were forwarded for examination. The man was accused of administering a narcotic drug to a woman in order, it was said, that while under its influence she might give a clue to the offender in a case of theft. From the symptoms the drug administered was probably Dhatura. The drugs forwarded were some roots and powders. Of these the roots were found to be plumbago roots and a number of the powders were found to contain plumbagin and a mercurial compound: (7) a case from Viramgam in which from the viscera of a man who died with symptoms of irritant poisoning, an organic principle was extracted resembling an alkaloid which when injected under the skin of dogs rapidly induced vomiting and purging.

20. Of the cases of alleged human poisoning in which no poison was detected, 63 or about 34.6 per cent., a somewhat larger percentage than usual, were cases in which the matters forwarded for examination consisted of the viscera of persons deceased. As usual these 63 cases may be divided into three groups or classes, viz., (1st) cases in which from the reports forwarded the balance of evidence is in favour of death being due to injury or disease; (2nd) cases in which while there is nothing to show that death was due to disease or injury there is at the same time nothing to show that death was due to poison; and (3rd) cases to which a certain amount of suspicion of poisoning attaches. Of the 63 cases 38 belong to the 1st, 14 to the 2nd, and 11 to the 3rd class. Of the 38 cases of the 1st class 21 were cases in which death appears to have been due to disease. Of the 21 in 12 the symptoms present indicated either cholera or irritant poisoning, while on *post-mortem* examination little or no appearances indicative of irritation of the alimentary canal were discovered pointing to cholera as the cause of death. 3 more were cases of death from fever, 3 cases of death from heart-disease, and 1 each death from epilepsy, tetanus and sun-stroke. Of the remaining 17 cases 4 appear to have been cases of death from snake-bite, 2 were cases of death from drowning, 2 cases of death from suffocation, 1 a case of death from hanging, and 1 a case of death from ruptured spleen. 6 more were cases of death following abortion, probably in all 6 not induced by the internal administration of drugs as in all no *post-mortem* appearances of irritation were present. The last case was one in which a man having died from the effects of bháng a complaint was made that the bháng he had eaten was poisoned. On analysis however no evidence could be obtained supporting this supposition.

21. As regards the remaining cases, the whole of the 14 belonging to the 2nd class were cases in which the only ground for suspecting poison appears to have been the fact that the individuals died suddenly. Very probably also the fact that death was sudden formed the chief ground for suspecting poisoning in 8 out of the 11 cases of the 3rd class, as in all 8 little or no information was furnished save a statement to the effect that it was suspected that deceased had been poisoned. Of the remaining 3 cases of the 3rd class, 2 were cases in which there was good reason to suppose that death was due to the effects of a vegetable purgative irritant. In one of the 2 in fact it was known that deceased had drunk as a purgative a decoction of the leaves of wild aloes. The third case was one in which a woman died with symptoms pointing to Dhatura poisoning shortly after swallowing a drug given to her by a reputed sorcerer.

22. Of the 35 cases in which no poison could be detected in matters other than viscera forwarded for examination, in 14 the matters forwarded consisted of drugs or powders, in 10 of articles of food, in 9 of vomited matters, and in 2 of the ashes of cremated bodies. In several of the 14 cases in which the matters forwarded were drugs or powders the articles submitted were identified as non-poisonous substances, and in the majority of the remaining cases there was but little reason to suspect the presence of poison in the matters sent for analysis. One case of this last description from Bijapur was accompanied by information to the effect that certain powders forwarded for examination had been given by one man to another as a charm. The recipient was directed to eat the powders and was told that this would have the effect of causing his buffalo to

give milk. Of the 10 cases in which the matters forwarded consisted of articles of food, 2 from the symptoms stated to have been present were possibly cases of Kodra (*Paspalum scrobiculatum*) poisoning, and one was a case in which some sugarcane juice was said to have caused slight symptoms of irritant poisoning in several persons. The remaining 7 were all cases in which individuals lodged complaints with the Police producing an article of food which they stated they suspected contained poison because it had a greatly bitter or unusual taste. Of the 9 cases in which vomited matters were forwarded for examination 5 it was stated, were suspected to be cases of Dhatura poisoning; 2 were suspected to be cases of opium poisoning; in one of these all that was sent for examination was a piece of cloth with a small stain on it said to be a stain of matters vomited by a boy; and the remaining 2 were cases in which persons having vomited once or twice after a meal suspected that poison had been mixed with their food.

23. *Cases of Real or Alleged Cattle-poisoning.*—91 cases of this class were submitted for examination and report during the year and in 53 of these poison was detected. Last year the corresponding numbers were 84 cases and 50 detections. So far as can be ascertained from the reports furnished the 53 cases in which poison was detected included the poisoning of 63 animals, all horned cattle. How the above figures compare with those of previous years will be seen from the table below:—

Year.	1884.	1885.	1886.	1887.	1888.
Number of cases referred	103	101	83	84	91
Number of detections	58	54	45	50	53
Animals killed—					
Ahmednagar	8	13	6	16	15
Belgaum	...	6	3	2	6
Bijapur	2	3	4	...	2
Khândesh	5	3	3	1	3
Násik	7	3	5	3	8
Poona	7	9	6	8	3
Sátára	12	8	4	...	8
Sholápur	1	6	13	9	3
Surat	3	6	2	2	...
Other districts	6	3	9	16	15
Total animals killed ...	51	60	55	57	63

24. In 16 of the cases in which poison was detected in the viscera of cattle more than one animal was killed. 2 of these cases, one in which 8 animals and another in which 4 animals were killed, came from the Ahmednagar District. In each of 2 more cases from respectively Sholápur and Niphád (Násik District) 3 animals were poisoned. In the remaining 12 cases the number of animals killed was in each instance 2. Of these 12 cases 2 came from the Berárs, 2 from Native States, 2 from Belgaum, 2 from Sátára and 1 each from Ahmednagar, Dhárwár, Khândesh and Násik. Of the 53 cases in which poison was detected in 6 the poison consisted of the seeds of *Cerbera thevetia* (yellow oleander). 4 of these cases came from Sholápur, 1 from Sátára and 1 from Bijapur. In the whole of the remaining 47 cases arsenious oxide was the poison employed.

25. *Cases in which Articles suspected to be Stained with Blood or other Animal Fluids were forwarded for Examination.*—87 cases of this class were referred for report during the past year involving the examination of no less than 297 articles. Of the 87, 18 were cases in which articles of clothing were forwarded to be examined for stains of spermatic fluid and the remainder were cases in which various articles were sent to be examined for stains of blood. Of the latter, blood stains were found on the articles forwarded in 51 cases, viz., in 25 on articles of clothing and in 26 on objects other than articles

of clothing. Among the objects other than articles of clothing on which stains of blood were found were the following weapons:—7 axes or hatchets, 3 knives, 3 swords, a reaping hook, an arrow, a pick-axe and an iron bar. None of the reports furnished with the cases of this class present any special features of medico-legal interest.

Section II.—Potable Waters.

26. During the year under report 280 samples of water were examined as to their fitness or otherwise for potable purposes as compared with 207 samples in 1887. Of the 280 samples, 140 were classed as good. The table which follows gives a summary of the results obtained:—

Number.	Station.	Date of Collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
1	Mount Abu.	June	No. 2 well at Ooria	10.50	1.89	.21	.56	Scanty, paramacia	Bad	Medical Officer, Mount Abu.
2	Do.	Do.	Village well at Ooria	14.00	2.03	1.20	.92	Abundant, alga	Do.	Do.
3	Aden	August	Well No. 10, Shaik Othman.	81.90	38.08	.00	.02	Rather abundant	Do.	Political Resident, Aden.
4	Do.	Do.	Well No. 11 Do. do.	119.00	62.18	.00	.02	Do. do.	Do.	Do.
5	Ahmedabad.	May	Stand-pipe	33.60	6.58	.07	.14	Scanty..	Good	Municipal Secretary.
6	Do.	October	Battery well	63.03	4.48	.35	.30	Do. paramacia	Bad	Executive Commissariat Officer.
7	Ahmednagar.	July	Cholera camp well	22.40	.03	.014	.4	Do. do.	Good	Medical Officer in charge
8	Do.	Do.	Do. do.	23.80	.98	.19	.04	Do. confervae, &c.	Bad	1st Bombay Grenadiers,
9	Do.	Do.	Do. do.	28.00	1.12	Nil	.01	Do. paramacia	Good	Ahmednagar.
10	Do.	Do.	Do. do.	40.00	2.03	.04	.03	Do. confervae	Bad	Do.
11	Do.	August	A well	23.10	0.84	.04	.03	Do. paramacia	Good	Do.
12	Do.	Do.	Nagar aqueduct	26.30	0.91	.03	.08	Do. monas vorticella	Do.	Ahmednagar.
13	Do.	Do.	A large tank	16.80	10.56	.16	.19	Do. do.	Bad	Do.
14	Do.	Do.	Do.	14.00	1.26	.13	.17	Abundant, confervae	Do.	Do.
15	Do.	Do.	Aqueduct used by Infantry.	24.50	.91	.07	.04	Scanty, paramacia	Good	Do.
16	Do.	Do.	Do. do.	20.00	.84	.03	.01	Do. do.	Do.	Medical Officer, Station
17	Do.	Do.	Do. used by R. A.	20.30	.91	.04	.03	Do. do.	Do.	Hospital.
18	Do.	Do.	Hospital well	24.50	.91	.16	.03	Do. do.	Do.	Do.
19	Do.	October	Well	56.00	5.60	.00	.15	Do. confervae	Do.	S. P. G. Mission School.
20	Do.	December	No. 1 well, European Infantry.	21.70	.42	.01	.06	Do. rotifers nematodes	Bad	Do.
21	Do.	Do.	No 2 do. do.	18.90	.70	Nil	.05	Do. monads, paramacia	Good	Medical Officer, Station
22	Do.	Do.	Native Infantry Lines well	20.30	.70	.03	.34	Abundant, paramacia and bacteria.	Bad	Hospital.
23	Do.	Do.	Royal Artillery well	22.40	.70	.00	.07	Scanty, paramacia	Good	Do.
24	Ajmere	January	Bhatlra kua	43.40	6.58	6.67	.46	Do. do.	Bad	Do.
25	Do.	Do.	Katun Bomric	27.30	1.82	.48	.35	Do. do.	Do.	Do.
26	Do.	Do.	Jhalra	46.90	5.60	.01	.23	Do. do.	Do.	Executive Engineer, Rājputāna Administration,
27	Do.	Do.	Sukkur kui	72.80	21.28	.21	.20	Do. vorticella	Do.	P. W. D.
28	Do.	Do.	Digrie	21.00	3.36	.01	.17	Do. paramacia	Good	Do.
29	Do.	Do.	Dhudia kua	59.50	15.54	.21	.28	Do. do.	Bad	Do.
30	Do.	Do.	Shorgaranka kua	30.10	4.90	.01	.10	Do. do.	Good	Do.
31	Do.	March	New well, Ajmere Jail	30.1	2.38	.04	.16	Do. do.	Do.	Do.
32	Do.	July	Doodhi well	77.70	17.72	.29	.22	Abundant, paramacia	Bad	Do.
33	Do.	Do.	Sukkur kui	111.30	28.28	.16	.19	Do. do.	Do.	Assistant Engineer, Aj-
34	Do.	Do.	New Bania's well, unfiltered	68.60	22.12	.27	.27	Do. do.	Do.	mere; Executive Engi-
35	Do.	Do.	Do. do., filtered	63.00	17.36	.16	.13	Do. do.	Do.	neer, Rājputāna P. W. D.
36	Do.	Do.	Anasagar Lake unfiltered	58.10	19.46	.59	1.94	Do. algae and paramacia.	Do.	Do.
37	Do.	Do.	Do. filtered	54.60	19.46	.03	1.84	Do. do.	Do.	Do.
38	Do.	November	Source not stated	37.80	8.64	.07	.19	Scanty, paramacia	Good	Do.
39	Do.	Do.	Do.	44.80	10.14	.13	.29	Abundant, paramacia	Bad	Do.
40	Do.	Do.	Do.	39.20	6.02	.11	.18	Scanty do.	Do.	Do.
41	Do.	Do.	Do.	47.60	7.56	.24	.20	Do. vorticella	Do.	Do.
42	Do.	Do.	Do.	58.80	13.65	.24	.16	Do. do.	Do.	Principal, Mayo College,
43	Do.	Do.	Do.	64.40	16.31	.03	.30	Do. do.	Do.	Ajmere.
44	Do.	Do.	Do.	70.70	21.42	.03	.36	Do. paramacia	Do.	Do.
45	Do.	Do.	Do.	54.60	17.85	.11	.10	Do. do.	Do.	Do.
46	Do.	Do.	Do.	84.70	30.10	.01	.07	Do. do.	Do.	Do.
47	Do.	Do.	Do.	71.40	18.69	.05	.13	Do. do.	Do.	Do.
48	Do.	Do.	Do.	49.70	9.58	.05	.10	Do. do.	Do.	Do.
49	Do.	December	Bania's well, unfiltered	72.90	22.12	.08	.14	Very scanty, no infusoria	Do.	Do.
50	Do.	Do.	Shuker kui well, filtered	77.00	23.52	.03	.22	Do. do.	Do.	Executive Engineer, Aj-
51	Do.	Do.	Do. unfiltered	88.20	26.74	.01	.15	Do. do.	Do.	mere, Provincial Divi-
52	Do.	Do.	Doodhia well, filtered	97.30	29.40	.04	.22	Do. paramacia	Do.	sion.
53	Do.	Do.	Do. unfiltered	68.60	21.00	.00	.17	Do. do.	Do.	Do.
54	Akola	January	Proposed town supply	56.70	7.98	.13	.32	Scanty, actinophrys	Do.	Executive Engineer, Akola.
55	Do.	February	Do. do.	18.20	8.85	.09	.08	Do. paramacia	Good	Do.
56	Amraoti	August	Wadali tank, filtered	10.50	.28	.01	.08	Do. do.	Do.	Executive Engineer, East
57	Do.	Do.	Do. unfiltered	10.50	.28	.03	.08	Do. do. and diatoms.	Do.	Berar.
58	Do.	October	Kariya well	72.10	8.68	Nil	.16	Do. do.	Bad	Deputy Commissioner.
59	Bhāvnagar	July	Well in town	279.30	127.40	144.00	1.22	Do. do.	Do.	President, B. G. Railway,
60	Bijāpur	August	Begum Talao	39.10	1.75	.03	.32	Abundant	Do.	Civil Surgeon, Bijāpur.
61	Do.	Do.	Shazunj pipe	154.70	27.65	.01	.02	Scanty, monads	Do.	Do.
62	Do.	Do.	Well, Executive Engineer's compound.	32.20	5.18	.17	.14	Do. paramacia	Fair	Executive Engineer, Bijāpur.
63	Do.	November	Neem Bavdeo	18.90	1.96	.32	.59	Do. do.	Bad	Do.
64	Do.	Do.	Asar Mahāl tank	52.50	8.40	.13	.34	Do. do.	Do.	Superintendent, Convict
65	Do.	Do.	Well opposite Mahādev's temple.	105.70	14.00	.04	.11	Do. do.	Do.	Gang.
66	Do.	Do.	Well near Post Office	39.20	3.15	.01	.10	Do. do.	Good	Do.
67	Do.	December	Karanja well	18.90	.98	.02	.04	Do. paramacia	Do.	Do.
68	Do.	Do.	Mango tree well	21.00	.84	.09	.05	Do. do.	Do.	Superintendent, Convict
69	Do.	Do.	No. 3 Gang well	18.20	1.96	.09	.04	Do. do.	Do.	Gang, Bijāpur.
70	Do.	Do.	Oomaje's well	22.40	1.82	.00	.01	Do. do.	Do.	Do.
71	Bombay	June	A new well	115.50	29.12	.43	.26	Do. actinophrys	Bad	Do.
72	Do.	December	Parcel terminus	7.70	.91	.01	.19	Do. paramacia	Good	Vehār-water, Tramway
73	Do.	Do.	Parcel stable	8.40	.91	.01	.21	Do. do.	Do.	Stables.
74	Do.	Do.	Eyenla bridge, N. S.	6.30	.84	.01	.21	Do. do.	Do.	Do.
75	Do.	Do.	Do. do. S. S.	4.20	.84	.01	.17	Do. do.	Do.	Do.
76	Buldana	February	Sayamba tank	6.30	.77	.04	.26	Do. do.	Do.	Executive Engineer, Wes
77	Do.	Do.	Sathrabar tank	14.70	.77	.01	.16	Do. do.	Fair	Berar.
78	Devkāl	December	Well No. 2	14.70	.98	.02	.15	Do. do.	Good	Assistant Engineer, Bool
79	Do.	Do.	Well No. 1	25.20	1.58	.05	.24	Do. do.	Do.	dana.
										District Staff Officer.

Number.	Station.	Date of Collection.	Source.	GRAIN PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
80	Dhārwar	June	Distillery well	49.70	4.06	.04	14	Scanty monads, bacteria	Bad	Executive Engineer, Belgaum.
81	Do.	Do.	Kelzari tank	21.70	6.02	.00	.35	Abundant	Do.	
82	Do.	August	Station well	30.10	9.10	.03	.20	Scanty, monads	Do.	
83	Do.	Do.	Amavay water	34.20	5.46	.04	.06	Do. diatoms	Do.	Resident Engineer, Southern Maratha Railway Company.
84	Do.	Do.	Kumbharjundi	31.50	2.94	.04	.22	Do.	Do.	
85	Do.	Do.	Londai well	16.10	.91	.03	.37	Do.	Do.	
86	Elliehpur	May	Public Works Department Office well.	28.00	1.05	.16	.10	Do. monads	Good	Executive Engineer, Hyderabad.
87	Hyderabad	April	Residency Bazar	15.40	1.82	.08	.28	Do. do. paramacia and ameba.	Do.	Executive Engineer.
88	Jabalpur	June	Hydrant	4.20	.35	.08	.23	Do. confervæ	Do.	Civil Surgeon.
89	Do.	October	Water-works	4.90	.21	.01	.05	Do. paramacia	Do.	
90	Jejuri	December	Peshwa tank	13.30	1.33	.01	.23	Do. do.	Do.	Executive Engineer, Nira Canal.
91	Do.	Do.	Holkar tank	23.10	2.94	.01	.18	Do. do.	Do.	
92	Do.	Do.	Peshwa tank	14.00	1.33	.01	.22	Do. do. Eutomos. traceæ.	Do.	
93	Junagad	February	Well	37.80	8.4	.00	.12	Do. paramacia	Do.	Executive Engineer, Junagad Railway.
94	Do.	August	Running room well	39.20	4.06	.03	.05	Do. do.	Do.	
95	Kaira	July	Gahua river	55.30	5.74	.13	1.30	Do.	Bad	Civil Surgeon.
96	Karachi	Do.	Maurypur Salt Works	215.60	127.40	Quant. not lysed		sufficient for further analysis	Do.	Collector of Customs.
97	Kirkee	September	Cholera Camp. A well	16.10	.70	.09	.03	Scanty	Good	Medical Officer, Station Hospital, Kirkee.
98	Do.	Do.	Do. B do.	15.40	.77	.00	.04	Do. paramacia	Do.	
99	Do.	Do.	Do. C South well	13.30	.98	.00	.04	Do. do.	Do.	
100	Do.	Do.	Do. C North well	18.20	.70	.00	.04	Abundant, confervæ	Do.	
101	Do.	Do.	Do. D do.	14.70	.70	.00	.06	Scanty, diatoms	Do.	
102	Do.	Do.	Hospital pipe	11.90	.70	.00	.06	Do. confervæ	Do.	
103	Do.	Do.	Barrack pipe	11.20	.68	.01	.05	Do. do.	Do.	Resident Engineer, Southern Maratha Railway.
104	Koregaon	July	Well	30.80	1.54	.00	.07	Do. do.	Do.	
105	Lonavla	March	Chamar's well	14.0	.98	.05	.25	Abundant	Bad	Deputy Sanitary Commissioner, C. R. D.
106	Do.	Do.	G. I. P. Railway well	26.60	1.54	.45	.22	Scanty, monads	Do.	
107	Do.	Do.	Stand pipe in village	2.10	.49	.04	.21	Do.	Do.	
108	Do.	Do.	Village tank	14.00	2.31	3.60	.70	Do. monads amoeba	Do.	
109	Do.	April	Bhusy village well	11.90	1.68	.07	.25	Do. paramacia	Good	
110	Do.	Do.	Bhangur Wari tank	19.60	4.41	.03	1.18	Do. do.	Bad	
111	Do.	Do.	Walman tank	23.60	1.26	.11	.43	Do. confervæ	Do.	
112	Do.	Do.	Hotel well	11.90	1.05	.00	.06	Do. confervæ, rotifers	Good	
113	Do.	Do.	Khandala tank	6.30	.70	.01	.39	Do. paramacia	Bad	
114	Do.	Do.	Well near Khandala tank	9.10	.98	.43	.13	Do. monads	Do.	
115	Do.	Do.	Hotel well, Khandala	9.80	.63	.16	.06	Do. do.	Good	
116	Loralai	January	Kareoz	40.60	3.99	1.01	.48	Abundant, paramacia	Bad	
117	Do.	Do.	Kareoz near artillery line	39.20	3.85	.01	.09	Do. do.	Fair	
118	Madar	August	Well	46.90	17.48	.16	.35	Scanty, paramacia	Bad	Executive Engineer, Rajputana-Malwa Railway.
119	Nagpur	January	Big tank, Umrer	4.20	.77	.59	.67	Do. do.	Do.	Civil Surgeon.
120	Do.	Do.	Jamua Talav, Nagpur	19.60	3.78	17.07	1.40	Do. do.	Do.	
121	Do.	Do.	Tank, Empress Mills	18.90	3.65	.08	.48	Do. vorticella	Do.	
122	Do.	Do.	Well	11.90	.91	.21	.30	Do. do.	Do.	Administrator, Rajpith State.
123	Nandod	August	Dediapada well	18.90	.77	.03	.03	Do. paramacia	Good	
124	Do.	Do.	Nandod well	27.30	2.87	.29	.20	Do. do.	Bad	
125	Nasirabad	July	New well near Danta	68.10	13.30	.07	.11	Do. do. rotifers.	Good	
126	Do.	Do.	New well at Danta unfiltered	41.30	13.65	.01	.03	Do. do.	Bad	
127	Do.	Do.	Do. do. filtered.	49.70	12.81	.07	.00	Do. do.	Do.	
128	Do.	Do.	Well No. 3, Bhir tank	26.60	6.61	.05	.06	Do. paramacia	Good	
129	Do.	Do.	Well No. 12 do.	36.40	5.88	.07	.04	Do. do.	Do.	Assistant Engineer, Rajputana.
130	Do.	Do.	Jaramun well	66.00	12.81	.03	.03	Do. vorticella	Bad	
131	Do.	Do.	Dilwara well.	38.50	3.85	.03	.02	Do. paramacia	Good	
132	Do.	August	New well at Danta, filtered.	61.80	10.50	.19	.03	Do. do.	Bad	
133	Do.	Do.	Dilwara water, filtered	31.50	3.99	.03	.05	Do. do.	Good	
134	Neemuch	June	Well No. 2	14.00	4.13	4.00	.48	Do. vorticella	Bad	Station Staff Officer, Neemuch.
135	Do.	Do.	Well No. 3	14.00	1.26	.16	.30	Do. paramacia	Do.	
136	Do.	Do.	Well No. 20	23.80	1.54	.01	.11	Abundant	Good	
137	Do.	Do.	Well No. 21	20.30	1.54	.09	.00	Scanty, monads	Do.	Medical Officer, 25th N. I.
138	Do.	July	Well No. 11	21.70	3.22	.03	.18	Do. paramacia	Do.	
139	Do.	Do.	Well No. 12	26.60	5.67	.01	.00	Do. do.	Do.	
140	Do.	Do.	Well No. 1	31.30	1.33	.35	.07	Do. do.	Bad	Station Staff Officer, Neemuch.
141	Do.	Do.	Well No. 5	31.30	1.33	.19	.22	Do. do.	Do.	
142	Do.	Do.	Well No. 6	38.50	1.75	.00	.18	Do. do.	Fair	
143	Do.	Do.	Well No. 11	37.80	4.40	.04	.06	Do. paramacia	Good	Cantonment Magistrate.
144	Do.	August	Well	18.20	.70	.04	.36	Do. do.	Bad	
145	Do.	Do.	Reservoir	13.30	.35	.24	.30	Abundant	Do.	
146	Do.	October	Do.	23.80	1.26	.00	.05	Scanty, paramacia	Good	Executive Engineer.
147	Nira Canal.	December	Cistern, filtered	23.60	2.8	.07	.21	Do. do.	Do.	
148	Panvel	March	Godri river	9.80	.77	.11	.12	Abundant, rotifers	Do.	
149	Do.	Do.	Godeshwar spring	9.10	.70	.03	.01	Nil	Do.	150 and 151 from Station Hospital supply. 152 and 153 artificial waters prepared by Medical Officer in charge.
150	Poona	Do.	Service pipe, unfiltered	2.10	.56	.00	.00	Scanty, paramacia	Do.	
151	Do.	Do.	Do. filtered	3.50	.70	.05	.14	Do. rotifers	Do.	
152	Do.	Do.	Artificial sample, unfiltered.	32.20	1.54	33.32	3.00	Abundant, monads and bacteria.	Bad	Executive Engineer, Poona.
153	Do.	Do.	Do. filtered	41.30	2.24	20.00	10.50	Scanty, do.	Do.	
154	Do.	April	Sakhara Nullah	21.70	.98	.13	.16	Do. confervæ diatoms.	Good	
155	Do.	Do.	Stream near town supply.	110.60	13.72	.24	.16	Do. paramacia	Bad	Resident Engineer, Southern Maratha Railway.
156	Do.	Do.	Pumping well	216.30	25.90	.21	.17	Do. do.	Do.	
157	Do.	May	Sirur River	23.80	3.64	.19	.14	Abundant, rotifers	Good	
158	Do.	June	Jejuri well	135.10	14.70	.00	.16	Scanty, rotifers	Bad	Medical Officer, 16th Regiment, N. I.
159	Do.	Do.	Phusangi well	32.20	2.24	.00	.17	Do. do.	Good	
160	Do.	Do.	Rajewadi well	23.10	1.12	.00	.13	Do. do.	Do.	
161	Do.	Do.	Ghorpuri well	33.60	2.52	.01	.10	Do. do.	Do.	Resident Engineer, Southern Maratha Railway.
162	Do.	August	Tayam well	22.40	1.12	.00	.02	Do. do.	Do.	
163	Do.	Do.	Miraj Station well	53.20	13.58	.00	.03	Do. do.	Bad	
164	Do.	Do.	Karad Station well.	21.70	1.33	.03	.02	Do. do.	Good	Medical Officer, 16th Regiment, N. I.
165	Do.	Do.	Kundal Road well	22.40	1.05	.00	.02	Do. do.	Do.	
166	Do.	September	Cholera Camp No. 1 well No. 1.	39.20	5.88	.24	.21	Scanty, confervæ	Bad	
167	Do.	Do.	Do. do. No. 2.	15.40	1.40	.11	.07	Do. anachæ, confervæ	Good	Medical Officer, 16th Regiment, N. I.
168	Do.	Do.	Do. do. No. 3.	14.70	1.26	.12	.04	Do. do	Do.	
169	Do.	Do.	Do. No. 2 well No. 1.	13.30	1.33	.17	.06	Do. confervæ, paramacia	Do.	
170	Do.	Do.	Do. No. 6 well No. 1.	26.60	1.12	.12	.02	Do. do. monads.	Do.	Resident Engineer, Southern Maratha Railway.
171	Do.	Do.	Do. No. 6 well No. 2.	19.60	1.40	.09	.02	Do. do. diatoms	Do.	
172	Do.	Do.	Do. No. 6 well No. 3.	28.00	1.47	.25	.03	Do. do.	Bad	
173	Do.	Do.	Do. No. 5 well No. 2.	21.00	1.33	.19	.01	Do. do.	Do.	Medical Officer, 16th Regiment, N. I.
174	Do.	Do.	Do. No. 5 well No. 3.	22.40	1.05	.00	.02	Do. paramacia	Good	

Number.	Station.	Date of Collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlorine.	Ammonia.				
						Free.	Albumenoid.			
175	Poona	October	Ghorpuri Barracks ..	1.40	.56	.01	.02	Scanty ..	Good ..	Medical Officer, Poona Station Hospital.
176	Do.	Do.	Do. ..	1.40	.49	.01	.02	Abundant ..	Do. ..	
177	Do.	Do.	Do. ..	3.50	.49	.00	.01	Scanty ..	Do. ..	
178	Do.	Do.	Ghorpuri Auxiliary Hospital.	2.80	.56	.01	.02	Do. ..	Do. ..	
179	Do.	Do.	Water-works, filtered ..	2.80	.49	.00	.02	Do. ..	Do. ..	
180	Do.	Do.	Macomara filter water ..	4.00	.49	.05	.04	Do. ..	Do. ..	
181	Do.	Do.	Wanorrie Barracks ..	3.50	.49	.00	.01	Do. ..	Do. ..	
182	Do.	Do.	Water-works, unfiltered ..	2.80	.49	.00	.01	Do. paramecia ..	Do. ..	
183	Do.	Do.	Cholera Camp No. 3 well	17.50	.98	.21	.04	Do. confervæ ..	Bad ..	
			No. 1.							
184	Do.	Do.	Do. do. No. 2.	23.10	.98	.16	.07	Do. do. ..	Do. ..	
185	Do.	Do.	Do. No. 4 well	25.00	1.60	.01	.02	Do. diatoms ..	Good ..	
			No. 1.							
186	Do.	Do.	Do. do. No. 2.	25.20	1.40	.00	.06	Abundant, paramecia ..	Do. ..	
187	Do.	Do.	Do. do. No. 3.	21.00	.98	.29	.07	Scanty, paramecia ..	Bad ..	Medical Officer, 26th N. I.
188	Do.	Do.	Do. No. 5 well	25.20	1.26	.00	.03	Do. confervæ ..	Good ..	
			No. 4.							
189	Do.	Do.	Do. No. 6 well	18.90	1.12	.01	.07	Do. ..	Do. ..	
			No. 1.							
190	Do.	Do.	Do. do. No. 4.	23.80	.98	.28	.06	Do. ..	Bad ..	
191	Do.	Do.	Do. No. 7 well	23.80	1.12	.16	.15	Do. ..	Good ..	
			No. 1.							
192	Do.	Do.	Do. do. No. 2.	23.80	1.26	.01	.11	Do. ..	Do. ..	Surgeon, 26th N. I.
			No. 3.							
193	Do.	Do.	Do. do. No. 3.	26.00	1.12	.00	.15	Do. paramecia ..	Do. ..	
194	Do.	November	Well near Lingayat Cemetery	17.50	1.26	.07	.10	Do. ..	Do. ..	Deputy Sanitary Commis-
195	Do.	Do.	Well near Mussahman Shrine.	23.80	1.26	.03	.12	Very scanty ..	Do. ..	sioner, C. R. D.
196	Purandhar	April	Tank ..	10.50	.56	1.07	1.08	Scanty, paramecia ..	Bad ..	Medical Officer, Puran-
197	Do.	Do.	Tank well ..	8.40	.98	.05	.50	Do. ..	Do. ..	dhar.
198	Raipur	July	Bure tank, filtered ..	51.10	3.92	.00	.12	Do. paramecia ..	Good ..	Deputy Commissioner,
199	Do.	Do.	Hospital well ..	18.90	2.80	1.60	1.68	Abundant ..	Bad ..	Raipur.
200	Rajkot	June	Lalpur River ..	34.30	4.90	.00	.08	Scanty ..	Good ..	
201	Do.	Do.	Adji River ..	32.20	4.90	1.44	.52	Do. ..	Bad ..	
202	Do.	Do.	Museum well ..	30.10	3.50	.01	.08	Abundant ..	Good ..	
203	Do.	Do.	Jail well ..	38.40	4.20	.03	.25	Scanty, confervæ ..	Bad ..	
204	Do.	Do.	Jaganath well ..	27.30	2.10	.07	.16	Do. paramecia ..	Good ..	
205	Do.	Do.	College well ..	136.50	19.60	1.20	.36	Abundant ..	Bad ..	
206	Do.	Do.	Kothi well ..	119.00	8.26	.13	.22	Scanty, paramecia ..	Do. ..	
207	Do.	July	Agency Engineer's bunga- low well.	25.90	2.31	.04	.10	Do. do. ..	Good ..	Kathiawar Agency Engi- neer.
208	Do.	Do.	Prant well ..	69.50	16.73	.69	.20	Do. ..	Bad ..	
209	Do.	Do.	Prant well ..	26.00	3.22	.04	.06	Do. ..	Good ..	
210	Do.	Do.	Pura well ..	37.80	6.44	.01	.14	Do. paramecia ..	Do. ..	
211	Do.	Do.	College south well ..	27.30	2.59	.03	.12	Do. ..	Do. ..	
212	Do.	Do.	Janoli well ..	28.70	3.22	.04	.08	Do. paramecia ..	Do. ..	
213	Do.	Do.	Sukaria well ..	32.90	3.57	.01	.05	Do. vorticella ..	Do. ..	
214	Do.	November	Aji water ..	23.10	3.5	.03	.34	Do. ..	Bad ..	
215	Do.	Do.	Bazar well ..	41.30	5.88	.03	.16	Do. paramecia ..	Do. ..	
216	Ratnagiri	January	Female Barrack well ..	8.40	1.05	.04	.03	Scanty, paramecia ..	Good ..	
217	Do.	Do.	Cook-room well ..	2.80	.77	.04	.27	Do. ..	Do. ..	Superintendent, Ratnagiri Jail.
218	Do.	Do.	Office well ..	1.40	.84	.04	.06	Do. paramecia ..	Do. ..	
219	Do.	March	Well near factory ..	5.60	.98	.27	.14	Do. rotifers ..	Do. ..	
220	Do.	Do.	Lower garden well ..	4.20	.98	.03	.13	Do. ..	Do. ..	
221	Do.	Do.	Upper garden well ..	4.90	1.12	.00	.11	Do. ..	Do. ..	
222	Do.	April	Rajapur Reservoir ..	4.20	.07	.03	.10	Do. monads ..	Do. ..	
223	Do.	Do.	Rajapur Hot Springs ..	32.20	3.50	.08	.14	Do. paramecia ..	Do. ..	
224	Do.	July	Tap water, Rajwada ..	2.10	0.70	.01	.03	Do. do. ..	Do. ..	
225	Do.	Do.	Well near Dhobies' Quar- ters.	1.40	.84	.16	.04	Do. ..	Do. ..	
226	Do.	Do.	Mussahman well, Rajwada ..	1.40	.84	.48	.14	Do. ..	Bad ..	Civil Surgeon.
227	Do.	Do.	Grave-yard well do. ..	8.40	1.19	.07	.05	Do. ..	Good ..	
228	Do.	Do.	Water at Nirla ..	34.30	6.86	.03	.12	Do. paramecia ..	Do. ..	
229	Do.	Do.	Well in Hahicheela's com- pound.	174.90	25.34	.03	.11	Do. do. ..	Bad ..	
230	Do.	Do.	Well in grave-yard ..	5.60	1.54	.04	.06	Do. monads ..	Good ..	
231	Do.	Do.	Hindu well ..	11.20	2.10	.03	.04	Do. do. ..	Do. ..	
232	Rewa Kántha	February	Magan well, Vajiria ..	92.40	17.50	.04	.43	Do. paramecia ..	Bad ..	
233	Do.	Do.	Hari well do. ..	37.80	2.59	.01	.12	Do. do. ..	Good ..	
234	Do.	Do.	Fatahpura well ..	69.20	21.70	.12	.18	Do. do. ..	Bad ..	
235	Do.	Do.	Mitha well, Vajiria ..	69.30	18.55	.07	.24	Do. do. ..	Do. ..	
236	Do.	Do.	Khara well do. ..	68.60	7.98	.07	.14	Do. do. ..	Do. ..	Assistant Political Agent, Rewa Kántha.
237	Do.	Do.	Sahelpura well ..	134.40	23.10	.20	.14	Do. do. ..	Do. ..	
238	Do.	Do.	Bhagman well, Vajiria ..	34.30	4.62	.12	.11	Do. do. ..	Good ..	
239	Do.	Do.	Vav, Vajiria ..	46.90	6.58	2.88	.78	Abundant, paramecia and rotifers	Bad ..	
240	Salpa	July	Salpa well ..	37.80	5.88	.00	.06	Scanty, paramecia ..	Good ..	Resident Engineer, South- ern Maratha Railway.
241	Do.	June	Massa Tank ..	23.80	1.26	.37	1.02	Do. bacteria ..	Bad ..	
242	Sátara	August	Well No. 1 ..	28.70	2.70	.09	.05	Do. paramecia ..	Good ..	
243	Do.	Do.	Well No. 2 ..	28.00	2.31	.03	.05	Do. confervæ ..	Do. ..	
244	Do.	Do.	Well No. 3 ..	46.20	9.52	.09	.06	Do. algae, paramecia, rotifers.	Bad ..	
245	Do.	Do.	Well No. 4 ..	26.60	2.45	.05	.06	Do. paramecia ..	Good ..	
246	Do.	Do.	Well No. 5 ..	26.60	3.64	.07	.14	Do. algae, confervæ, pa- ramecia.	Do. ..	
247	Do.	Do.	Well No. 6 ..	20.40	1.68	.03	.08	Do. algae, no infusoria ..	Do. ..	
248	Do.	Do.	Well No. 7 ..	134.30	3.50	.01	.09	Do. paramecia ..	Do. ..	
249	Do.	Do.	Well No. 8 ..	28.00	3.01	.03	.08	Do. do. ..	Do. ..	
250	Do.	Do.	Well No. 9 ..	11.20	.70	.11	.10	Abundant, paramecia ..	Do. ..	Medical Officer in charge Station Hospital, Sátara.
251	Do.	Do.	Well No. 10 ..	23.90	.98	.03	.45	Scanty, algae ..	Bad ..	
252	Do.	Do.	Well No. 11 ..	18.90	.91	.01	.21	Do. paramecia ..	Do. ..	
253	Do.	Do.	Well No. 12 ..	15.40	.98	.03	.19	Abundant do. ..	Do. ..	
254	Do.	Do.	Well No. 13 ..	9.80	.70	.03	.09	Scanty do. ..	Good ..	
255	Do.	October	Tank No. 10, Shirsagar ..	21.70	.98	.32	.50	Do. monads ..	Bad ..	
256	Do.	Do.	Massa tank, No. 12 ..	16.10	.98	.23	.29	Do. confervæ ..	Do. ..	
257	Do.	Do.	Manglai tank, No. 11 ..	14.00	.70	.00	.30	Do. do. ..	Do. ..	
258	Do.	Do.	Bhumani tank, No. 15 ..	7.70	.70	.00	.20	Do. do. ..	Do. ..	
259	Do.	Do.	Kote tank, No. 14 ..	10.50	.84	.00	.30	Do. paramecia ..	Do. ..	
260	Do.	December	River Varva, Kokrud vil- lage.	4.20	.70	.09	.08	Do. ..	Good ..	
261	Do.	Do.	Do. Sonavada vil- lage.	2.10	.63	.07	.06	Do. rotifers ..	Do. ..	Civil Surgeon, Sátara.
262	Do.	Do.	Do. Landur vil- lage.	46.20	5.88	.02	.11	Do. paramecia ..	Bad ..	

Number.	Station.	Date of Collection.	Source.	GRAINS PER GALLON.		PARTS PER MILLION.		Sediment.	Column added by order of Government.	By whom sent, and Remarks.
				Total Solids.	Chlo- rine.	Ammonia.				
						Free.	Albu- me- noid.			
263	Sátara ..	December ..	River Varna, Kurung ali village.	3.50	1.40	.04	.09	Abundant, paramecia ..	Good ..	Civil Surgeon, Sátara.
264	Secunderabad ..	April ..	New pit ..	51.10	4.90	.24	.12	Scanty ..	Bad ..	Executive Engineer.
265	Sirdárpur ..	January ..	Jhalwa out-post ..	37.80	2.87	.43	.46	Do. diatoms and monads ..	Do. ..	Medical Officer, Málwa Bhil Corps.
266	Sirur ..	September ..	Government Stable well ..	58.10	4.90	.14	.01	Scanty, paramecia ..	}	Medical Officer, Poona Horse.
267	Do. ..	Do. ..	Colonel's well ..	58.10	4.90	.11	.01	Do. do. ..		
268	Do. ..	Do. ..	Mess well ..	53.20	4.48	.16	.08	Do. do. ..		
269	Do. ..	Do. ..	Captain's well ..	42.00	2.38	.07	.02	Do. do. ..		
270	Do. ..	Do. ..	Colonel Hogg's well ..	46.90	3.78	.16	.05	Do. diatoms ..		
271	Do. ..	December ..	Regimental trough well ..	23.10	2.69	.24	.14	Nil ..		Officer Commanding Poona Horse.
272	Sukkur ..	October ..	Miáni well reservoir ..	34.30	3.78	.16	.10	Scanty, paramecia ..		Civil Surgeon, Sukkur.
273	Taloda ..	September ..	Modagaum step well ..	29.40	3.67	1.60	.55	Do. confervæ ..		Mámlatdár of Taloda, Khándesh.
274	Tánsa ..	March ..	Tánsa ..	11.20	.77	.11	.24	Scanty, paramecia amæhn ..	Fair ..	Inspector General of Prisons.
275	Thána ..	May ..	Atgao well ..	20.30	1.12	.01	.32	Abundant, monads ..	Bad ..	Civil Surgeon, Thána.
276	Do. ..	August ..	Pokran tank ..	11.20	.77	.03	.11	Scanty, algæ ..		Superintendent, Thána Jail.
277	Viramgám ..	December ..	Well near Railway Goods Office.	60.90	23.38	.21	.12	Do. paramecia ..		} Sub-Overseer, Viramgám and Kháraghoda Works.
278	Do. ..	Do. ..	Well near Library ..	147.70	49.98	.03	.04	Do. do. ..		
279	Wálhe ..	July ..	Wálhe well ..	19.60	1.12	.00	.07	Do. ..	Good ..	Resident Engineer, Southern Marátha Railway.
280	Yerrowda ..	January ..	Well in Jail Hospital ..	5.60	.49	.01	.11	Do. algæ, paramecia ..	Do. ..	Medical Officer.

Section III.—Government Stores.

27. The articles coming under this description examined during the past year were 500 in number as compared with 355 in 1887. The articles consisted of—

Commissariat Stores.

Samples of Malt liquor	...	...	109
" Lime-juice	...	...	123
" Tea	...	...	25
" Sugar	...	...	30
" Sundry foods	...	...	12
" Soap	...	...	65
" Disinfectants and sundries	...	...	22
—386			

Ordnance and other Stores.

Samples of mercuric fulminate	...	...	47
" Metals and alloys	...	...	4
" Antimony sulphide	...	...	11
" Bee'swax	...	...	14
" Nitric acid	...	...	13
" Sundry ordnance stores	...	...	8
" Other Government stores	...	...	17
—114			
500			

28. *Malt Liquor*.—Of the 109 samples of malt liquor examined during the year under report 26 were samples from three consignments of porter and ale imported by Government for the use of troops. These 26 samples were as usual taken—2 per cask—from 13 hogsheads, viz., 5 of ale and 8 of porter, one sample being drawn on arrival of the consignment and the other six days after landing it. The table below shows the results obtained on examination of the second drawn sample from each cask :—

Brewery Number.	Description of Liquor.					Extract Gravity.	Beer Gravity.	Original Gravity.	Alcohol by Volume per Cent.	Acidity as Hydrated Acetic Acid per Cent.
1	Ale	...	...	...	...	1,019.8	1,010.7	1,060.3	6.49	0.29
"	"	...	...	...	...	1,019.6	1,010.6	1,059.6	6.40	0.28
"	"	...	...	...	...	1,018.6	1,009.1	1,061.1	6.80	0.30
"	"	...	...	...	...	1,018.7	1,009.5	1,059.7	6.56	0.30
"	"	...	...	...	...	1,015.1	1,005.4	1,058.6	6.96	0.34

Brewery Number.	Description of Liquor.	Extract Gravity.	Beer Gravity.	Original Gravity.	Alcohol by Volume per Cent.	Acidity as Hydrated Acetic Acid per Cent.
1	Porter	1,021.7	1,013.4	1,057.7	5.87	0.33
"	"	1,021.8	1,013.4	1,058.2	5.94	0.34
"	"	1,020.0	1,011.0	1,060.0	6.40	0.30
"	"	1,020.8	1,012.1	1,059.1	6.17	0.34
2	"	1,018.4	1,009.6	1,057.2	6.25	0.34
"	"	1,018.8	1,010.3	1,055.9	6.02	0.29
"	"	1,018.0	1,009.7	1,054.0	5.87	0.34
"	"	1,018.2	1,009.9	1,054.2	5.87	0.32

29. *Malt Liquor—continued.*—Of the remaining 83 samples 68 were forwarded by Commissariat Officers at different stations from casks which had been condemned by Station Committees, and of these 55 came from one station, *viz.*, Ahmednagar. All 68 samples on examination proved to be of good original quality and the majority were found to be in fair condition. In 18 of these 68 samples the total acidity (estimated as acetic acid) did not exceed .40 per cent, in 37 more it did not exceed .50 per cent, and in the remainder, 13 in number, the acidity was under .60 per cent. The remaining 15 samples consisted of 2 samples of English ale and 2 of English porter forwarded for examination as to quality, and 11 samples of Indian brewed malt liquor, *viz.*, 4 of ale and 7 of porter. The average results obtained from the 11 Indian brewed samples are shown below:—

Liquor.	Extract Gravity.	Beer Gravity.	Original Gravity.	Alcohol by Volume per Cent.	Acidity as Hydrated Acetic Acid per Cent.
Ale	1,023.2	1,014.9	1,059.1	5.84	.33
Porter	1,025.7	1,017.4	1,061.9	5.89	.35

30. *Lime-juice.*—123 samples of lime-juice from casks tendered by contractors to the Commissariat Department were examined during the past year. Of these 25 were rejected as being of inferior quality; 10 of these 25 were of very low strength.

31. *Tea.*—25 samples of tea were submitted to this officer for report during the year. Of these one was a sample of a supply tendered to the Jamsetji Jijibhai Hospital; this was found to be of bad quality. The remaining 24 were sent for examination by the Commissariat Department as samples of supplies tendered by contractors. Of these 7 were rejected for inferiority of quality. The average results obtained from the 17 accepted samples were much the same as last year, *viz.*:—

Specific gravity of a 10 per cent. decoction	...	1,010.5
Soluble ash per cent.	...	3.74
Insoluble do.	...	2.64
Total ash per cent.	...	6.38

32. *Sugar and Sundry Articles of Food.*—30 samples of sugar were examined on behalf of the Commissariat Department, all of which proved to be of good quality. The sundry articles of food examined consisted of (a) 5 samples of ghee, forwarded 2 from the Jamsetji Jijibhai Hospital, 1 from Thana Jail and 2 by the Bombay Commissariat. Of the 5, 4 were found to be of good quality, the fifth, one of the Commissariat samples, was rejected as adulterated. The specific gravity of this sample at 100° F (water at 100° F=1) was found to be .9003, and its volatile acidity as butyric acid equalled 3.53 per cent., while the average results obtained from the other 4 samples was specific gravity .9093 and volatile acidity 6.13 per cent.: (b) 2 samples of mustard oil

both forwarded by the Bombay Commissariat of which one had to be rejected as adulterated: (c) 1 sample of Indian arrow-root forwarded by the Bombay Commissariat which on examination proved to be "Maranta" arrow-root of good quality: (d) a sample of bread sent by the Commissariat Officer at Sátara; this on examination was found to be rather close in texture, but otherwise of good quality: (e) a sample of butter forwarded from Neemuch Station Hospital and alleged to contain some "green material." On examination nothing corresponding to this description could be found in the sample: and (f) 2 samples of rum stated to be respectively "Bengal" and "Mundwa Distillery" rum, forwarded by the Commissariat Officer at Poona; these gave on examination the following results:—

			Bengal.	Mundwa.
Strength over-proof...	...	...	0.7	4.4
Extractive per cent.	...	...	.490	.069
Volume acidity as acetic acid per cent	...	...	.026	.029
Fixed acidity as tartaric acid per cent.	...	...	.087	.024

33. *Soap*.—65 samples of soap were examined for the Commissariat Department, viz., 32 samples of bar and 33 samples of soft soap. In each of these 65 samples the percentages of water present was determined and reported so as to enable the Commissariat to fix the price to be paid for the supply. The percentage of water present in the 33 samples of soft soap was pretty uniform, 32 of them yielding between 37 and 45½ per cent. Of the 32 samples of bar soap 3 contained under 20 per cent. of water, 3 over 20 and under 30 per cent., 7 over 30 and under 40 per cent., 9 from 40 to 50 per cent., and 10 over 50 per cent.

34. *Disinfectants and Sundries*.—The 22 samples coming under this head consisted of 9 samples of disinfecting powder, 3 of carbolic acid, 6 of kerosine-oil, 1 sample of tin and 3 samples of kousoo. All the samples of disinfecting powder were found to be of good quality and of the strength required by contract. Of the 3 samples of carbolic acid one was rejected as inferior in quality. All 6 samples of kerosine were found to be of the quality required by contract, viz., not under 77° Abel flash. The single sample of tin from a supply for tinning copper vessels was found to be free from lead and of good quality. 2 of the 3 samples of kousoo were rejected.

35. *Ordnance Stores*.—47 samples of mercuric fulminate were qualitatively examined for the Small Arms Ammunition Factory, Kirkee. All were samples made in the factory, and all on examination were found to be free from acidity and apparently of good quality. For the same factory also were examined 4 samples of metals, viz., 2 samples of metallic tin, 1 sample of metallic lead and 1 sample of an alloy of lead and antimony. Besides the articles just enumerated 46 samples of sundry ordnance stores were examined, mostly for the factory above-named. These consisted of 11 samples of antimony sulphide of which 4 were rejected as consisting wholly and 1 as consisting partly of lead sulphide. 14 samples of bee'swax, 13 samples of nitric acid, 3 samples of shellac, 3 of spirits of wine, and 1 sample each of Neat's foot-oil and blacking for leather.

36. *Other Government Stores*.—Under this head may be classed the following: (a) 1 sample of bichromate of potash and 1 sample of tar examined for the Telegraph Department: (b) 3 samples of drugs examined for the Government Medical Stores, viz., 1 each of calomel, hydrochlorate of morphia and Acetate of morphia. Of these the calomel which had been complained of by a Medical Officer as causing undue irritation was found to contain corrosive sublimate. The morphia salts were both somewhat brown in colour, the acetate most so; this, excepted the hydrochlorate, appeared to be of good quality, but the acetate was found to be deficient in acetic acid: (c) 3 embroidered badges which had become slightly spotted with white spots forwarded by the Army Clothing Department. On examination the white spots were found to be composed of minute cells and to be readily removeable by moderate friction: (d) 4 samples of Indian made blue-black ink and one of blue-black ink powders. These, with one exception, viz., a sample of ink forwarded from a Government office to which it had been supplied, were forwarded by the Superintendent of Stationery

Of the samples of ink forwarded from the Stationery Department two were sent for comparison and selection; of these one proved to be better than the other and apparently quite equal in quality to English-made blue black-ink. The third sample was from a further supply of the approved ink and was found to be equal in quality to the original sample. The approved ink was also found to be superior in quality to ink prepared from the powders: and lastly (e) 3 samples of lubricating oils and 1 of a deposit said to have resulted from their use, forwarded by the Marine Store-keeper, Bombay. On examination the samples of oil were found to consist almost wholly of mineral oil, while the the deposit consisted mainly of iron rust and finely divided carbon.

Section IV.—Customs and A'bkari Analyses.

37. During the year under report 598 samples of various substances were examined for Customs and Abkari purposes as compared with 652 last year. The slight decrease in number this year as compared with last is due to the gauging of ordinary wines and spirits being now undertaken by the gaugers of the Customs Department under the arrangement referred to in paragraph 40 of this office report for last year. Such articles deducted, the total number of samples examined last year for Customs and Abkari purposes was 471: hence in all other respects there has been a considerable increase in the amount of work devolving on this office for Customs and Abkari purposes. The 598 samples examined during the year comprised—

Samples of wood spirit and methylated spirit	...	17
„ other imported supposed alcoholic liquids	...	94
„ country liquor		13
„ opium, gánja and salt		29
„ petroleum...		395
„ explosives		50
Total	...	598

38. *Wood Spirit and Methylated Spirit.*—4 samples of so called wood spirit were examined as to their fitness for the purpose of methylating spirits of wine. Of these 2 were found to be genuine wood spirit and suitable for the purpose required; the other two were found to be samples of mineral naphtha not miscible with water and not suitable for the purpose of methylating spirit. In addition 13 samples of imported methylated spirit were forwarded for examination and opinion as to whether they had been “effectively and permanently rendered unfit for human consumption”. Of these, 10 were passed as sufficiently and 3 rejected as insufficiently fouled.

39. *Other Imported supposed Alcoholic Liquids.*—94 samples coming under this description, chiefly medicinal preparations and perfumes, were during the year examined for alcoholic strength at the request of the Customs Department. Of these, 23 were found to be free or practically free from alcohol. The alcoholic strength of the remaining 71 stated in terms of proof spirit was:—

In 16	...	...	... under 20 per cent.
„ 17	...	...	... 20 to 50 „ „
„ 15	...	...	... 50 to 100 „ „
„ 13	...	...	... over 100 „ „

40. *Country Liquor, &c.*—13 samples of liquor prepared or purchased in India were examined at the request of Customs or A'bkari authorities. Of these, 6 were sent to be examined for the presence of copper, and of these only 1 was found to be free from this metal. 2 of the 6 samples were sent from Dhulia and were described,—the one as liquor obtained straight from the still and the other the same liquor after filtration through cloth as sold to purchasers. Both were found to have a distinct greenish tinge due to the presence of copper and the first had also a number of minute green particles suspended in it. On further examination the sample from the still was found to contain over 2 grains per ounce of copper, while the filtered sample contained about one-tenth of a grain per ounce of the same metal. The questions at issue in regard to the other 7 samples were, in one what was the strength of the liquor, in another whether a sample of mowra sent for examination contained toddy, and

in two whether or no some flavouring matter had been added to the liquor. Lastly three samples were sent to be examined for adulteration with a narcotic drug: no such substance, however, could be detected in any of them.

41. *Opium, Gánja and Salt*.—21 samples of opium or substances suspected to be opium, 4 samples of gánja or substances suspected to contain it, and 4 samples of salt were examined during the year. Of the opium samples 13 were sent from Násik to be examined for adulteration, and of these 3 were found to contain realgar (red sulphide of arsenic). Of the remaining 8 samples 4 were sent from Kaira, 2 from Bhusával and 1 by the Bombay Customs; all these were found to be free from adulteration and of good quality: and lastly one sample sent from Dholka of a substance suspected to be opium proved on examination to be entirely free from this drug. Of the 4 gánja samples 1 was sent from Násik to be examined as to quality and proved to be good; this sample yielded 15·70 per cent. of ash; 2 more were sent from Málegaon, one being a sample of fresh and the other a sample of old gánja; of these the latter had been complained of as causing injurious effects when smoked. On examination the only difference to be found between the two samples was that the suspected one was drier than the other. These samples yielded respectively 15·29 and 20·88 per cent. of ash. Lastly, 1 sample of Gulchand (conserved roses) was sent by the Magistrate of Vinchur in order that it might be examined for Cannabis, from which, however, it was found to be free. As regards the 4 samples of salt 2 were sent by the Collector of Customs, Karáchi, one of them being a sample found to be deliquescent and to taste bitter, while the other was a sample of approved quality sent for comparison. On examination, as might be expected, the deliquescence and bitter taste complained of were found to be due to the presence of magnesium chloride. A third sample, also sent from Karáchi, was described as Deliyar salt; this gave to analysis per cent. insoluble residue ·09, calcium sulphate ·94 and magnesium chloride 1·41. Lastly, one sample of salt was sent by the Collector of Customs, Bombay, the question in regard to it being whether or no the salt might be considered as having been permanently rendered unfit for human consumption. On examination the specimen was found to contain a considerable quantity of impure magnesium sulphate, a substance which although somewhat difficult to separate from common salt can hardly be said to render it unfit for consumption.

42. *Petroleum*.—Of the 395 samples examined during the year 372 were samples from the cargoes of the 21 petroleum-laden ships which arrived in Bombay harbour during 1888. Of these 21 ships 16 brought about 1,110,000 cases of Russian oil from Batoum and 5 brought about 293,000 cases of American oil from New York. All 16 cargoes of Russian oil were of about one uniform quality, flashing at about 83° to 85°F (Abel) and of specific gravity about 818 to 821. Of the American oil about 46,000 cases consisted of 150° fire test oil, flashing at over 100°F (Abel) and the remainder of oil flashing at about 76° to 81°F (Abel). No sample flashing below the legal minimum was found in any one of the cargoes.

43. *Petroleum—continued*.—The remaining 23 samples of petroleum sent for examination by the Customs authorities during the year under report comprised (a) 8 samples from 6 small consignments from various (chiefly eastern) ports. Of these, one consignment from Mohamerah was found to have a flashing point below the legal minimum and was accordingly reported as “dangerous petroleum”: (b) 7 samples of lubricating oil, all of which were found to be either non-mineral or to have a flashing point above 200°F and hence to be not liable to petroleum duty under Act II of 1888: and (c) 8 samples of liquids suspected to be “dangerous petroleum,” viz., 7 of liquids described as turpentine and 1 of a liquid described as Benzol. Of these last 8 samples 3, viz., the one Benzol and two of the turpentine samples, were found to be specimens of petroleum of so inflammable a nature that even when cooled down to a temperature below 40°F they took fire and burnt continuously when a small flame was held near them. In other words the fire-test or burning-point of these samples was below 40°F, and undoubtedly therefore their *Abel flashing point* was also below 40°F. I have here used the words Abel “flashing point” instead of “legal flashing point” because it appears to me that the combined effect of Section 4 (1) of the Petroleum Act of 1886 and the proviso contained in para-

graph 4, Section (4), Part III of the Schedule of the same Act, is to make it impossible to determine the "legal flashing point" of such samples. The proviso of the schedule just referred to makes it in fact impossible to determine the "legal flashing point" of any sample of petroleum the "Abel flashing point" of which is lower than 8°F above the lowest temperature capable of being recorded by the authorized apparatus, that is to say, in the case of the authorized apparatus supplied to this office when the "Abel flashing point" of the sample is below 48°F. I may here remark that the proviso of the schedule which thus limits the power of determining the "legal flashing point" of samples of petroleum was introduced as a safeguard against discrepancies from false flashes, and I think that what I have pointed out above shows that such discrepancies must be guarded against in some other way. As to what this way should be I am strongly in favour of altering the procedure at the commencement of the testing. I would in fact commence the testing by leaving the filled oil-cup on the water bath with the slide *open* and the test-lamp unlighted for a certain interval, say, while the oil thermometer rises at least 8°F. After this interval I would close the slide, light the test-lamp, and set the clock-work first in motion directly the oil thermometer shows a rise of 1°F above the temperature it showed at the time of closing the slide. I would further direct that in ordinary cases the slide is to be closed at or below 59°F as shown by the oil thermometer, but that in cases where the question is, whether the flashing point of a sample is above or below a certain specified temperature, *e.g.* 120°F or 200°F, the slide is to be closed at least 11°F below the temperature in question, *e.g.* not above 109°F when the specified temperature is 120°F or not above 189°F when the specified temperature is 200°F. As an additional recommendation in favour of the adoption the modifications of procedure mentioned above, I would point out that their adoption would greatly facilitate the testing of lubricating oils under Act II of 1888. At present the testing officer before he can declare the flashing point of a sample to be above 200°F must test the oil at each degree F from 56° to 200°F, while if the modifications above proposed are adopted it will only be necessary for him to test the oil at each degree F between 190°F and 200°F.

44. *Explosives*.—During the year under report 50 samples of various imported explosives were examined under the provisions of the Explosives Act, *viz.*, 30 samples of blasting gelatine, 12 of dynamite, 6 of gelatine dynamite, and 2 of gun-cotton. All passed the prescribed tests.

Section V.—Miscellaneous.

45. The 54 examinations coming under this head comprised—

Samples of food	...	...	15
„ of limestones and limes	...	...	15
„ of water	...	...	3
„ sundry substances	...	...	21
Total			54

46. *Food*.—10 samples of grain or flour, 2 samples of bread and 1 sample of sugar were forwarded for examination from various stations, the question at issue in regard to them being their fitness or otherwise for human consumption. Although some of the samples of grain were found to be old and dirty none of the 13 samples above enumerated could be declared to be absolutely unfit for food. One sample of milk from a supply tendered by the contractor was sent for examination by the First Physician, J. J. Hospital, Bombay. This sample having a low specific gravity (1024.8) was suspected to be adulterated. On examination it yielded the following results per cent.: fat 6.16, solids not fat 8.46, ash .63. Lastly, one sample of arrow-root prepared at the Gondal Experimental Farm was sent for examination by the Bombay Chamber of Commerce. This proved to be "Maranta" arrow-root of good quality.

47. *Limestones and Limes*.—5 samples of limestone and 10 samples of slaked lime were quantitatively examined. Of the samples of limestone 2 were sent in connection with a civil case pending before the Court at Thana, the question being whether or no one was superior in quality to the other. Both samples were found on analysis to be practically identical in composition. The

other 3 samples were sent by the Engineer in charge Tánša Water-works. These yielded to analysis the results shown below—

		(1)	(2)	(3)
Sand, &c., insoluble in acid	...	·33	1·20	5·43
Silicic acid ...	...	9·75	8·70	9·52
Ferric oxide and alumina	...	6·98	7·26	8·02
Calcium carbonate	...	79·72	81·32	72·55
Magnesium carbonate	...	3·22	1·52	4·48
		100·00	100·00	100·00

Of the 10 samples of slaked lime 3 were sent by the Executive Engineer, Ahmedabad District, and were labelled as from respectively (1) Tagdi, (2) Bhimnath and (3) Sadra. On analysis these were found to vary in composition chiefly in respect of the percentage of sand, &c., insoluble in acids giving respectively 7·92, 15·68 and 30·17 per cent. of such matters. The remaining 7 samples of slaked lime were sent in connection with the Tánša Water-works. These were all found to be very similar to one another in composition yielding from about 7 to 15 per cent. of sand, from about 7 to 16½ per cent. of silicic acid, and from about 8½ to 10¼ per cent. of ferric oxide and alumina.

48. *Water.*—3 samples of water intended for other than potable use were examined during the year. Of these one was a sample from a well at Aden sent by the Commissariat Department, the question in regard to it being as to whether or no it was better fitted for use in the boilers of the Government Bakery at that station than a sample reported on last year. The previous sample had yielded in grains per gallon, total solids 2,338·0, chlorine 784·0, sulphuric acid 88·83, and lime 185·84; while the sample sent this year gave total solids 1,433·6, chlorine 504·0, sulphuric acid 88·55, and lime 210·49 grains per gallon. Both samples therefore were unsuitable for the purpose indicated but the last-mentioned sample was reported as least so. The other two samples of water were both of them sent by the Locomotive Superintendent, Rájputána-Málwa Railway, to be examined as to their fitness for use in locomotive boilers. Of these one yielded only 37·10 grains per gallon of total solids, the other however gave in grains per gallon total solids 177·10, chlorine 57·40 and sulphuric acid 19·18.

49. *Sundry Substances.*—Of the substances coming under this head about 15 were specimens of various matters examined in connection with an outbreak of fire preceded, it is said, by an explosion which occurred in August last in a goods waggon at the Carnac Bander Station of the B. B. & C. I. Railway. On inquiry the Railway authorities found reason to suspect that the fire had originated in two boxes forming part of the contents of the waggon. They therefore having called on the sender of these boxes to furnish samples of their contents submitted the same to me for examination. I found in these samples, among other matters, powdered charcoal, sulphide of arsenic, potassium chlorate, and strontium nitrate: in other words the ingredients of the firework mixture known as red fire—a mixture which is known to be liable to spontaneous ignition. The sender of the boxes however asserted that although the materials mentioned were contained in the boxes in question the said materials were not mixed together but packed up separately. This statement was to a certain extent supported by the results obtained from the examination of the contents of similar boxes previously despatched by the same person. Other miscellaneous matters examined during the year under report were as follows:—(a) 2 samples of a substance found buried in an old building at Bijápúr in a case where the ownership of the building was in dispute. It was thought possible that the substance found might be the remains of a quantity of gunpowder. This, if the case, would have supported one of the rival claims to the property. No trace however of the essential constituents of gunpowder could be found in the substance in question: (b) 2 samples of country brewed beer sent by the Chemical Examiner, Madras. These had been taken from a supply tendered by a contractor and had been found to be of lower original gravity than what had been contracted for. The results of an examination of these two samples confirmed the Madras Examiner's opinion as to their strength; (c) a sample of clay sent by the Political Agent, Pálanpur,

the question at issue in regard to it being as to the nature of certain metallic looking particles present therein. These proved to be particles of iron pyrites and of no value: (d) a piece of red flannel sent by one of the Physicians of the J. J. Hospital to be examined for the presence of arsenical dye. No arsenic could be detected in the specimen sent.

50. The duties of Assistant Chemical Analyser to Government were during the first ten months of the year under report discharged by Assistant Surgeon M. G. Deshmukh, M.D., with the same praiseworthy diligence and care as in previous years. During the last two months of the year under report, while Assistant Surgeon Deshmukh was absent on leave, his duties were performed with great industry and to my entire satisfaction by Assistant Surgeon N. K. Kallianwala.

I have the honour to be,

Sir,

Your most obedient Servant,

B. LYON, F.C.S., F.I.C., Brigade Surgeon,
Chemical Analyser to Government.

Bombay Castle, 2nd August 1889.

Letter from the Surgeon General with the Government of Bombay, No. S.B.—254, dated 20th May 1889—Submitting with his remarks the Report of the Chemical Analyser to Government for the year 1888.

Letter from the Surgeon General with the Government of Bombay, No. 4094, dated 11th June 1889.

Letter from the Government of India, Home Department (Medical), No. 328, dated 10th June 1889.

RESOLUTION.—The report of the Chemical Analyser to Government for the year 1888, shews as did that for 1887 that the work of the Department over which that officer presides exhibits a strong tendency to increase year by year. The number of cases dealt with and of analyses effected under each head except that of Customs and A'bkári is in excess of that recorded for any previous year. The increase is especially noticeable as regards medico-legal cases and Government stores. During the year under report 360 medico-legal cases were dealt with as against 282 in the previous year and 1,432 analyses were effected in 1888 as compared with 1,266 in the preceding year. From the fact that nearly 21 per cent. of the cases of suspected human poisoning, which were sent up and in which no poison was discovered, were cases belonging to that class in which the balance of evidence was in favour of death being due to injury or disease rather than to poison it may be questioned whether an unnecessary amount of work was not thrown upon the Department by the officers sending up these cases. The increase in the number of medico-legal cases is chiefly under the head of articles stained with blood and other animal fluids, while that in the number of analyses of Government stores is due to the fact that during the year under report more samples than were examined in the previous year of malt liquor lime juice and soap were analysed by the Department.

2. Of the 360 medico-legal cases 182 were of real or alleged poisoning of human beings, 91 were of real or alleged poisoning of cattle, and 87 were of a miscellaneous nature chiefly involving the examination of articles suspected to be stained with blood or other animal fluids. The number of cases of the first class in which poison was discovered amounted only to 46·2 per cent. which is a rather smaller proportion than usual. The Districts which furnished the largest numbers of cases were Poona, Kaira, Sholápur and Belgaum. The number of persons poisoned was 102, of whom 48 died. The poison most largely used was again arsenious oxide which was discovered in 34 cases and caused 26 deaths, while opium was the poison employed in 15 cases. Five cases of *dhatúra* poisoning of which one only proved fatal, were investigated. In consequence of the circumstances of many of the cases not having been reported to the Chemical Analyser it is impossible to see how many were homicidal and how many suicidal and it would be well in future if all officers sending up cases supplied with them such information as may be in their possession on these points.

3. The number of cases of real or alleged cattle poisoning sent up during the year was 91 and in 53 of these poison was discovered. Both these figures are slightly in excess of the corresponding ones for the previous year. The offence of cattle poisoning was again most prevalent in Ahmednagar in which district nearly 25 per cent. of the cases investigated occurred. The total number of animals destroyed was, as far as can be ascertained, 63, all of them being horned cattle.

4. During the year under report 280 samples of potable water were examined as against 207 samples in the previous year. Of this number 50 per cent. were classed as good. It is noticeable that only one sample was sent up by a Municipality and His Excellency in Council regrets to observe that with one exception no samples of village drinking water were submitted by district officers. In reviewing the report last year it was pointed out that the exami-

nation of specimens of the water drunk in outlying villages especially those in which attacks of cholera are frequent would be of value, and Government trust that the matter will not be neglected during the current year.

5. As regards the examination of Commissariat and Ordnance Stores there is nothing to remark except the increase in the number of samples submitted. This is specially noticeable in the case of malt liquors 55 samples of which were sent up from one station (Ahmednagar) alone. Of 83 samples condemned by Station Committees 68 were found on examination to be of good original quality and the majority were found to be in fair condition. This being so it is not easy to understand the grounds on which they were condemned.

6. For Customs and A'bkári purposes 598 samples were examined during the year under report as against 652 in the previous year. The decrease in number is due to the gauging of ordinary wine and spirits being undertaken by the gaugers of the Customs Department instead of as formerly by the Chemical Analyser. Of the samples analysed during the year 395 were of petroleum, 17 of wood and methylated spirit, 94 of other imported supposed alcoholic liquids, 50 of explosives and the remainder of country-liquor, opium, gánja and salt. Of 13 samples of country-liquor 5 were found to contain copper. Of these two came from Dhulia and one of them, described as liquor straight from the still, contained 2 grains of copper per ounce while the other described as the same liquor, after filtration, as sold to purchasers contained $\frac{1}{10}$ th grain per ounce of the same metal.

7. The Surgeon General with the Government of Bombay draws attention to Dr. Lyon's remarks in the 43rd paragraph of the report, on the subject of the *Abel flashing point* of petroleum. The attention of the Government of India should be invited to these remarks.

8. His Excellency in Council is glad to observe that the duties of the Assistant Chemical Analyser during ten months of the year under review were discharged by Assistant Surgeon M. G. Deshmukh with the same diligence and care as have in previous years gained for him the favourable notice of his superior officer and that for the remaining two months these duties were performed by Assistant Surgeon N. K. Kallianwála in a manner which gave satisfaction to Dr. Lyon.

J. DE C. ATKINS,

Acting Under Secretary to Government.

To

The Surgeon General with the Government of Bombay,
 The Sanitary Commissioner for the Government of Bombay,
 The Municipal Commissioner for the City of Bombay,
 The Commissioner of Police, Bombay,
 All District Superintendents of Police,
 All Collectors, including the Collectors and Deputy Commissioners in Sind,
 The Commissioner, N. D.,
 The Commissioner, C. D.,
 The Commissioner, S. D.,
 The Commissioner in Sind,
 The Commissioner of Customs, Salt, Opium and A'bkári,
 The Revenue Department of the Secretariat,
 The Judicial Department of the Secretariat,
 The Political Department of the Secretariat,
 The Military Department of the Secretariat,
 The Compiler, General Administration Report for 1888-89.
 The Director of Land Records and Agriculture,
 The Government of India,
 The Secretary of State for India. }

With copies
 of the report.

} By letter.